

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 11-15, 18 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The recitation, “a second portion of the air is divided into a first fraction and a second fraction, wherein said first fraction is boosted in a booster” (lines 6-7) includes within its scope that the second portion is divided into fractions and then the first fraction is boosted by the booster. AS this is not taught by the application, the recitation contains new matter.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 11-15, 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The recitation, “wherein between 40 and 90% of the air sent for distillation is boosted” (lines 9) lacks antecedent basis. It is presumed that to read –wherein between 40 and 90% of the air compressed by the compressor is boosted by the booster--.

The recitation, "the first fraction of the air is cooled in the heat exchange line" (line10) repeats what is recited in line 7 that the first fraction is cooled in the heat exchange line, therefore the recitation is indefinite as it is unclear if the first fraction is being cooled again.

The recitation, "wherein the air sent to the medium pressure column" (lines 11-12) is unclear and indefinite as there is no discerning what air stream is being referred to.

The recitation, "which is the pressure of the mixing column; then reduced in pressure to enter the mixing column" (lines 11-12) is indefinite as it is unclear how a stream can be the pressure cited and then be reduced and still be the pressure cited. Further and most importantly the phrase, "the reduced in pressure to enter the mixing column" has no reference to what stream is being reduced in pressure to enter the mixing column. Further it is not clear how this step is "then" performed, as if indicating some order required to the step.

In regard to claim 15, it is noted that claim 11 already requires that the pressure of the mixing column be between 8 and 20 bar. Therefore it is unclear how this limitation is not exactly repetitive.

The following is a quotation of a portion of the fourth paragraph of 35 U.S.C. 112:

...a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitations of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

In regard to claim 18, Claim 18 fails to comply with the fourth paragraph of section 112.

It is noted that the independent claim requires that the boosted air be between 8 and 20

bar and therefore, the dependent claim cannot not require between 12 and 30 bar because a pressure of between 20 and 30 would not infringe on the independent claim but would infringe on the dependent claim. The applicant is directed to MPEP 608.01(n) for direction on the infringement test.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 11-15, 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hogg et al. (5,490,391) in view of Howard (US 5802873) and further in view of Corduan (US 2003/0051504).

In regard to claims 11-15 and 18-20, Hogg teaches a method for separating air by cryogenic distillation in an installation comprising a medium-pressure column (28), a low-pressure column (36) and a mixing column (68) in which: a) air is compressed in a compressor (12), cooled in a heat exchange line (20, 42, 84, 34) and a first portion (66)

of the air is sent to a vessel of the mixing column (68); b) a second portion (18) of the air is cooled in the heat exchange line (20, 42, 84, 34), the second portion (18) is divided into a first fraction (32) and a second fraction (26), wherein the second portion (18) is between 40% and 90% of the air compressed by the compressor (12; column 3, line 43; 23% of total air is processed through expander 64 connected to compressor 60; therefore the second portion 18 is $100 - 23 = 77\%$ of total air); c) the first fraction (32) of the air is cooled in the heat exchange line (20, 42, 84, 34; as already stated above), at least partially liquefied, and sent to the medium-pressure column (28), wherein the first portion (66) of the air is reduced in pressure (via 64) to enter the mixing column (68); d) the second fraction (26) of the air is expanded in a Claude turbine (24) and sent to the medium-pressure column (28); e) an oxygen-enriched liquid (40) and a nitrogen-enriched liquid (50) are sent from the medium-pressure column (28) to the low-pressure column (36); f) an oxygen-enriched liquid (70) is sent from the low-pressure column (36) to a top of the mixing column (68); g) at least one flow of liquid (70 or 93) is drawn off from the medium (28) or low-pressure column (36); and h) an oxygen-rich flow (76) is drawn off from the mixing column (68) and heated in the heat exchange line (20, 42, 84, 34). It is noted that Hogg teaches that the liquid drawn off from the low-pressure column (36) is an end product (86, column 6, lines 10-12).

Hogg does not teach that the second portion is compressed to between 8 and 20 bar before heat exchange line portion (20); however, it is well known in the art to further compress or boost air to between 8 and 20 bar with a booster compressor prior to expanding the stream with a turbine for the purpose of obtaining refrigeration from

expansion with no or little external energy, as taught by Howard. Howard teaches boosting a portion of feed air (46) to between 8 and 20 bar (column 4, lines 24-25, 150-500 psia teaching therefore 10 bar, 15, bar, 20 bar etc) with a booster (5 or 4) that is driven by a turbine (8 or 7) which provides refrigeration and drives the booster (5 or 4). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Hogg with a booster on line (18) driven by the turbine (24) for the purpose of increasing the refrigeration obtained from the turbine (24) and for the purpose of providing the refrigeration with no or little external energy making the procedure more efficient.

Lastly, Hogg as modified, does not explicitly teach that the mixing column operates at a pressure of between 8 and 20 bar. However, it is well known to operate mixing columns at such pressure as taught by Corduan (parag. 51). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to operate the mixing column at a pressure between 8 and 20 bar for the purpose of efficiently heat exchanging the streams therein and providing the pressure sufficient for transfer to the other distillation columns.

Claims 11-15, 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hogg in view of Corduan.

In regard to claims 11-15 and 19-20, Hogg teaches a method for separating air by cryogenic distillation in an installation comprising a medium-pressure column (28), a low-pressure column (36) and a mixing column (68) in which: a) air is compressed in a

compressor (12), cooled in a heat exchange line (20, 42, 84, 34) and a first portion (66) of the air is sent to a vessel of the mixing column (68); b) a second portion (18) of the air is cooled in the heat exchange line (20, 42, 84, 34), the second portion (18) is divided into a first fraction (32) and a second fraction (26), wherein the second portion (18) is between 40% and 90% of the air compressed by the compressor (12; column 3, line 43; 23% of total air is processed through expander 64 connected to compressor 60; therefore the second portion 18 is $100 - 23 = 77\%$ of total air); c) the first fraction (32) of the air is cooled in the heat exchange line (20, 42, 84, 34; as already stated above), at least partially liquefied, and sent to the medium-pressure column (28), wherein the first portion (66) of the air is reduced in pressure (via 64) to enter the mixing column (68); d) the second fraction (26) of the air is expanded in a Claude turbine (24) and sent to the medium-pressure column (28); e) an oxygen-enriched liquid (40) and a nitrogen-enriched liquid (50) are sent from the medium-pressure column (28) to the low-pressure column (36); f) an oxygen-enriched liquid (70) is sent from the low-pressure column (36) to a top of the mixing column (68); g) at least one flow of liquid (70 or 93) is drawn off from the medium (28) or low-pressure column (36); and h) an oxygen-rich flow (76) is drawn off from the mixing column (68) and heated in the heat exchange line (20, 42, 84, 34). It is noted that Hogg teaches that the liquid drawn off from the low-pressure column (36) is an end product (86, column 6, lines 10-12).

Hogg does not teach that the second portion is compressed to between 8 and 20 bar before heat exchange line portion (20) and that the pressure of the mixing column (68) is between 8 and 20 bar; however, it is well known in the art to further compress or

boost air to between 8 and 20 bar with a booster compressor prior to expanding the stream with a turbine for the purpose of obtaining refrigeration from expansion with no or little external energy, as taught by Corduan. Corduan teaches boosting a portion of feed air (1) to between 8 and 20 bar (paragraph 54, 8 bar) with a booster (71) that is driven by a turbine (75) which provides refrigeration and drives the booster (75).

Corduan also teaches operating the mixing column (27) at a pressure between 8 and 20 bar (paragraph 51 and 18) for the purpose of providing sufficient heat exchange and providing sufficient pressures for distillation. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Hogg with a booster on line (18) driven by the turbine (24) for the purpose of increasing the refrigeration obtained from the turbine (24) and for the purpose of providing the refrigeration with no or little external energy making the procedure more efficient; and to further modify Hogg to operate the mixing column (68), at between 8 and 20 bar for the purpose of efficiently heat exchanging the streams therein and providing the pressure sufficient for transfer to the other distillation columns.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hogg in view of Corduan and further in view of Howard. Hogg and Corduan teach most of the claim limitations but does not teach compressing the boosted air is boosted to a pressure between 12 and 20 bar. However, Howard explicitly teaches boosting a portion of air further for the purpose of providing increased refrigeration. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to

boost the second portion (18) of air to a pressure of 15 bar for the purpose of increasing the refrigeration provided.

Response to Arguments

Applicant's arguments filed 04/20/2010 have been fully considered but they are not persuasive.

1. Applicant's arguments (page 4, ¶ 6) are an allegation that Hogg does not teach that the second portion is between 40 - 90% of the air compressed by the compressor. In response, it is noted that 77% of the air compressed by the compressor is boosted by the booster (column 3, lines 40-45). Therefore the allegation is unpersuasive.

2. Applicant's arguments (page 4, ¶ 7) are that Corduan does not teach that the second portion is divided into first and second fractions. In response, it is noted that the argument does not address the grounds of rejection. The grounds of rejection do not state that Corduan teaches first and second fractions from the second portion and therefore the argument is not persuasive that the rejection in view of the teachings of Hogg, Corduan, and Howard as detailed above is improper.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John F. Pettitt whose telephone number is 571-272-0771. The examiner can normally be reached on M-F 8a-4p.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler or Frantz Jules can be reached on 571-272-4834 or 571-272-

6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John F Pettitt /
Examiner, Art Unit 3744

JFP III
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